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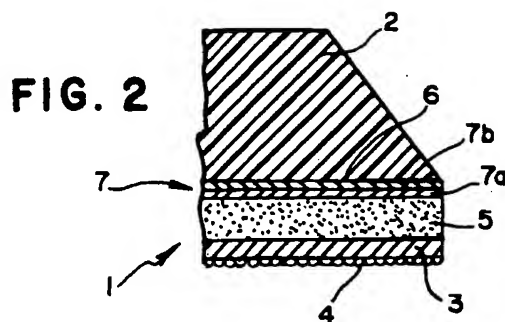
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(54) **Abrasive tool.**

(57) An abrasive tool, such as a disc (1), which is adapted for ready attachment and release from the back-up pad of a sanding or polishing machine is improved by the interposition of a resilient foam layer (5) between an abrasive-containing layer (4) and a fabric substrate layer (6). The ready attachment and release mechanism comprises preferably hook and loop attachment means.



**EP 0 578 865 A1**

This invention refers to an abrasive tool and an abrasive disc.

It is known that sanding and polishing operations are carried out by machines that use readily detachable and replaceable abrasive discs, abrasive strips, or similar tools, releasably fastened to suitable plates, which move in generally orbital or reciprocating fashion. In this specification, the term "tool" is used to describe all forms of releasably attached discs, belts or strips and the like.

Current sanding and polishing techniques substantially meet the requirements of the industrial sector, for instance, in auto-body assembly lines, as well as the crafts sector such as in auto-body shops. There are, however, widespread complaints about the disadvantage of uneven wear on the abrasive coating.

This results in an inefficient use of the tool, which is discarded before it is completely used up, and poor sanding and polishing performance, probably owing to the fact that the abrasive tends to get stuck in the worn-out area.

In some cases attempts have been made to interpose a polymeric layer between an abrasive sheet and an attachment means comprising a pressure sensitive adhesive (PSA) layer. Such devices have not proved totally satisfactory because of the inherent problems associated with PSA materials such as stringiness, deposition on the plate to which the tool is adhered in use, performance variation dependent on temperature and humidity and so on. In addition, if the PSA is applied directly to the polymeric layer, any plasticizer present therein can migrate through the paper and deteriorate the PSA very seriously. The present invention permits a much more versatile approach to the use of detachable abrasive tools that at the same time gives distinct additional performance improvements.

The object of the present invention is to provide an abrasive tool of the type specified which overcomes the disadvantages mentioned above.

This object is solved by the abrasive tool according to independent claim 1 and the abrasive disc according to independent claim 9. Further advantageous features, aspects and details of the invention are evident from the dependent claims, the description and the drawings. The claims are to be understood as a first non-limiting approach to define the invention in general terms. The abrasive tool according to the present invention, such as a disc, strip and the like, is useable for sanding and polishing machine of the type comprising an abrasive-containing layer and a fabric backing layer adapted to be fastened to a plate on the machine.

For such sanding and polishing operations fine grits with grit sizes of 80 and smaller are used. It is in the context of such products that this invention

finds its greatest utility.

The abrasive tool of the invention comprises an abrasive containing layer and a fabric substrate adapted for hook and loop attachment to a support plate, and a resilient foam layer located between the abrasive containing layer and the fabric substrate.

The fabric substrate may be attached directly to the resilient foam layer or it may be provided with an intermediate scrim or a plastic or paper layer firmly adhered to both the intermediate layer and to the foam layer.

The resilient foam layer may be of any suitable material such as a polyurethane, a natural or artificial rubber such as a polybutadiene, polyisoprene, EPDM polymer, PVC, polychloroprene, or styrene/butadiene copolymer. Polyurethane foams are preferred because they have the right combination of resilience and strength to withstand the considerable shear forces that are encountered in use.

The abrasive-containing layer comprises the abrasive and a binder holding the abrasive to a substrate backing layer. The abrasive itself can be any one of those commonly used as abrasives such as fused alumina, alumina/zirconia, silicon carbide or solgel process formed, seeded or unseeded, ceramic alumina grains. The binder can be any of the commonly used binders such as phenolic resins, polyurethanes, epoxy resins and radiation curable resins. The backing layer may be a fabric but more frequently it is a paper or a plastic sheet. The paper is conventionally a heavy duty paper of the type commonly used for abrasive disc products. The backing layer, where this is a fabric, may have been treated with one or more fill coats prior to being coated, and the abrasive-containing layer can have placed over it a size coat and, optionally, a supersize coat.

Further features and advantages of the abrasive tool according to this invention will become clear from the following description of a preferred model, given in an indicative, but not limiting manner, with reference to the attached figures, where:

Figure 1 shows a top view of the plate of a sanding and polishing machine, fitted with an abrasive tool in accordance with this invention.

Figure 2 shows a section view of a detail of the tool in Figure 1.

The Drawings show an abrasive tool comprising, in this example, a 150 mm diameter disc 1 attached to a plate 2 of equal diameter on a sanding and polishing machine.

The disc 1 comprises a flexible support which is generally, a sheet of a fabric, paper or plastic material. On one side of support 3 is a coating of an abrasive material 4, such as aluminum oxide. This flexible support 3 together with the abrasive-

containing layer is referred elsewhere as the "abrasive-containing layer".

Adhered to the other side of the flexible support 3 is a layer 5 of a resilient material, such as a plastic foam. Polyurethane is a suitable plastic material. The preferred thickness of this layer 5 is between about 1 to 5 mm, preferably 1 to 3 mm, more preferably 2 to 3 mm, most preferably 3 mm.

The density of the layer 5 is preferably between about 20 kg/m<sup>3</sup> and 30 kg/m<sup>3</sup>, more preferably about 25 kg/m<sup>3</sup>.

Layer 5 can be attached to the flexible support 3 with an appropriate adhesive or by heat.

Layer 5 is covered with a fabric 6 bearing on the opposite face to that adhered to the resilient foam layer one cooperating component of a hook and loop attachment system. In the Drawings the component attached to the fabric 6 is the loop component 7a. The most frequently encountered variant of such systems is sold under the trade name of "Velcro". The purpose of the system is to provide a means for reasonably adhering the tool to the plate 2 which bears the other component of the system (as shown here, the "hook" component) shown as fabric component 7b.

On the disc 1, layer 5 is found between support 3, which is intended to engage the work surface with the coating of abrasive material, and the coating of adhesive material, which is designed to engage the plate.

Because of the resilience, the layer 5 absorbs the differences in shape between the work surface, which may be irregular, and the plate which is substantially flat, enabling the use of the entire abrasive surface.

The tool has shown an increased life, an even wear, and optimal self-cleaning capability.

Since the presence of the layer of resilient foam material gives the abrasive material increased pliancy, it is possible to work uneven surfaces also with harder plates. This also allows a longer life of the plate.

An improved adhesion of the tool to the plate has been noted, being effective over a long period even under intensive working conditions.

### Claims

1. An abrasive tool comprising an abrasive-containing layer (4) and a fabric substrate (3) as well as a resilient foam layer (5) located between the abrasive-containing layer (4) and the fabric substrate (3).
2. The abrasive tool according to claim 1, wherein the fabric substrate (3) is adapted for hook and loop attachment (7a, 7b) to a support plate.

3. The abrasive tool according to claim 1 or 2, wherein the layer (5) of resilient foam material is adhered directly to both the abrasive-containing layer (4) and the fabric substrate (3).

4. The abrasive tool according to one of the preceding claims wherein the layer (5) of resilient foam material is a foamed polyurethane.

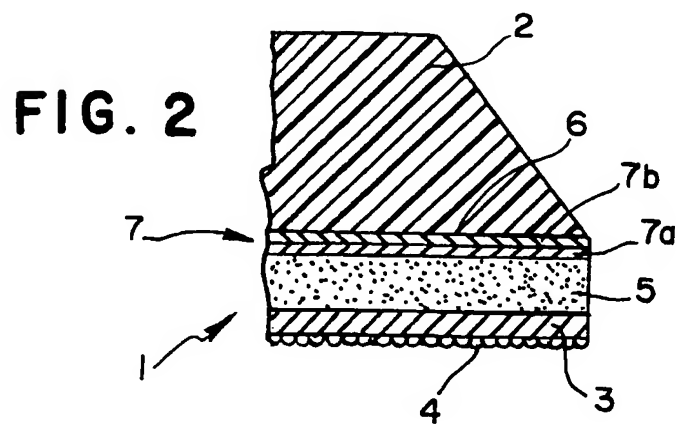
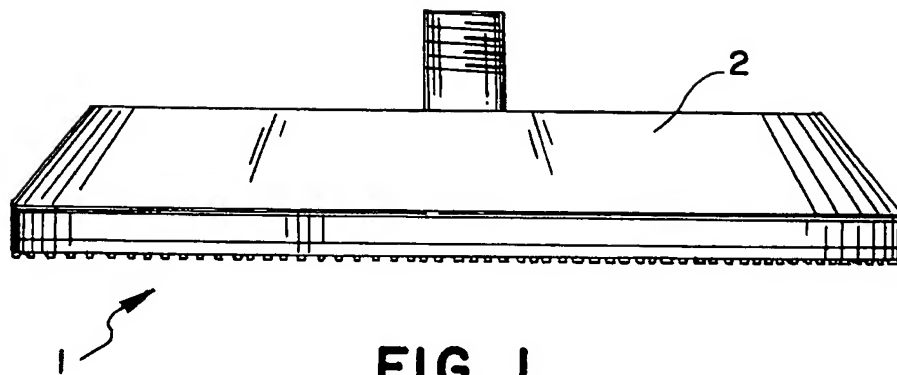
5. The abrasive tool according to claim 4, wherein the polyurethane layer has a density between 20 and 30 kg/m<sup>3</sup>.

6. The abrasive tool according to one of the preceding claims in which the resilient foam layer (5) has a thickness of between 1 to 5mm, preferably about 1 mm to 3 mm, more preferably 2 to 3 mm, most preferably 3 mm.

7. The abrasive tool according to one of the preceding claims in which an intermediate layer is interposed between the fabric substrate layer (3) and the resilient foam layer (5).

8. The abrasive tool according to one of the preceding claims in the form of a disc (1).

9. An abrasive disc (1) comprising a fabric substrate layer (3) adapted to be affixed releasably by hook and loop means (7a, 7b) to a support plate (2) on a rotary sander device, said substrate layer (3) being adhered to a first surface of a foamed polyurethane layer (5) with a density of from 20 to 30 kg/m<sup>3</sup> and a thickness of from between 1 to 5 mm, preferably 1 to 3 mm, more preferably 2 to 3 mm, most preferably 3 mm, the opposed second surface of the foam layer being adhered to an abrasive containing layer (4).





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## EUROPEAN SEARCH REPORT

Application Number

EP 92 12 1679

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
X	DE-A-3 903 204 (JÖST, PETER) * the whole document * ---	1-3,6,8,9	B24D3/00 B24D9/08
A	GB-A-2 189 802 (VEB INDUSTRIEBURSTEN BERLIN) * the whole document * ---	1,4,5,7	
A	DE-A-3 840 019 (ABBATIS HOLDINGS LTD) * the whole document * ---	1,2,9	
A	DE-A-2 820 370 (MARTON, MIKSA) * page 13, line 26 - page 15, line 27; figure 1 * ---	1,9	
A,P	EP-A-0 513 772 (NORTON COMPANY) -----		
			TECHNICAL FIELDS SEARCHED (Int. Cl.5)
			B24D
The present search report has been drawn up for all claims			
Place of search BERLIN		Date of completion of the search 14 OCTOBER 1993	Examiner CUNY J.
<b>CATEGORY OF CITED DOCUMENTS</b> X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons ----- A : member of the same patent family, corresponding document			